170-135.28

Fig. 1.

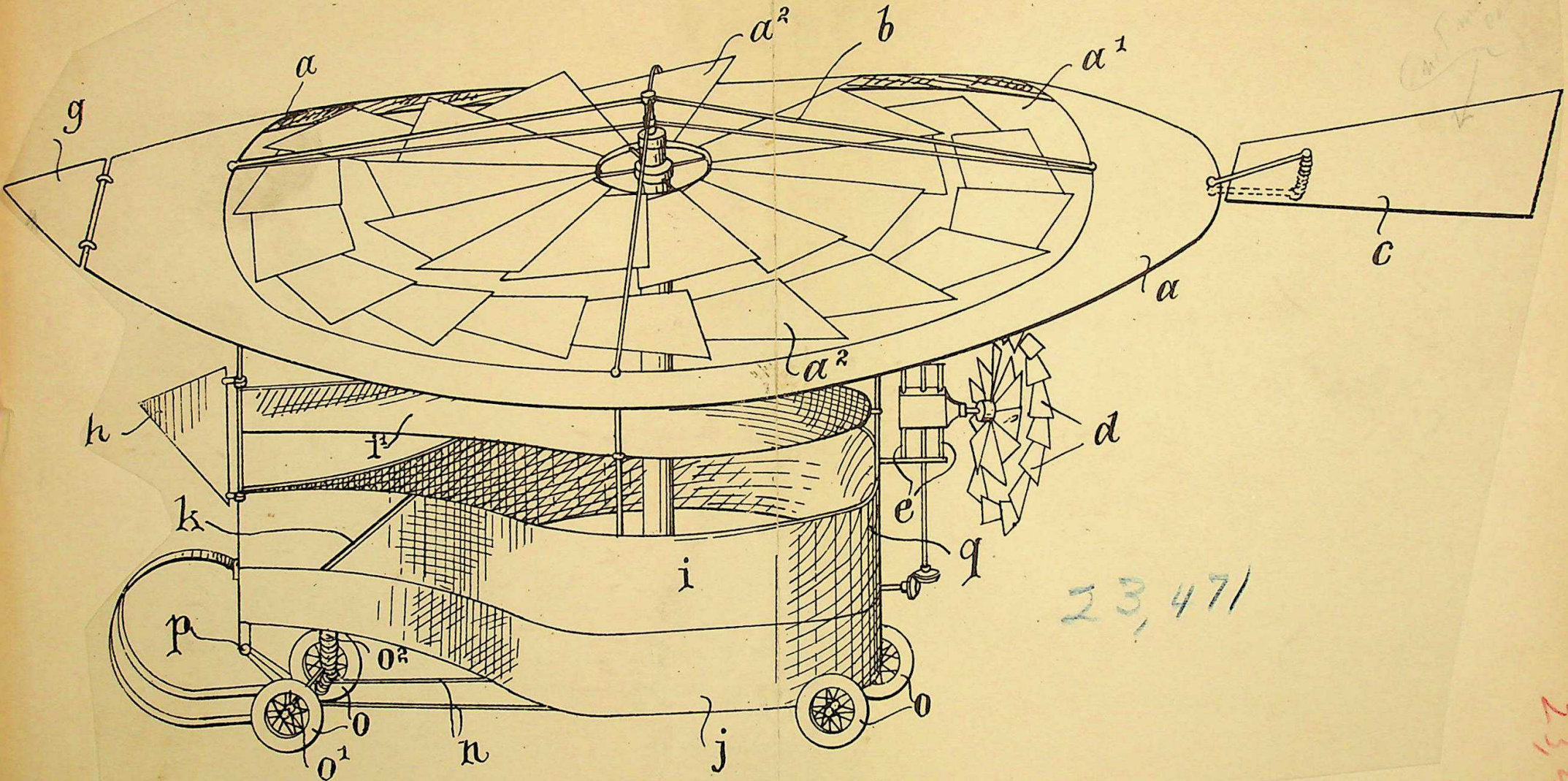

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Fig. 2.

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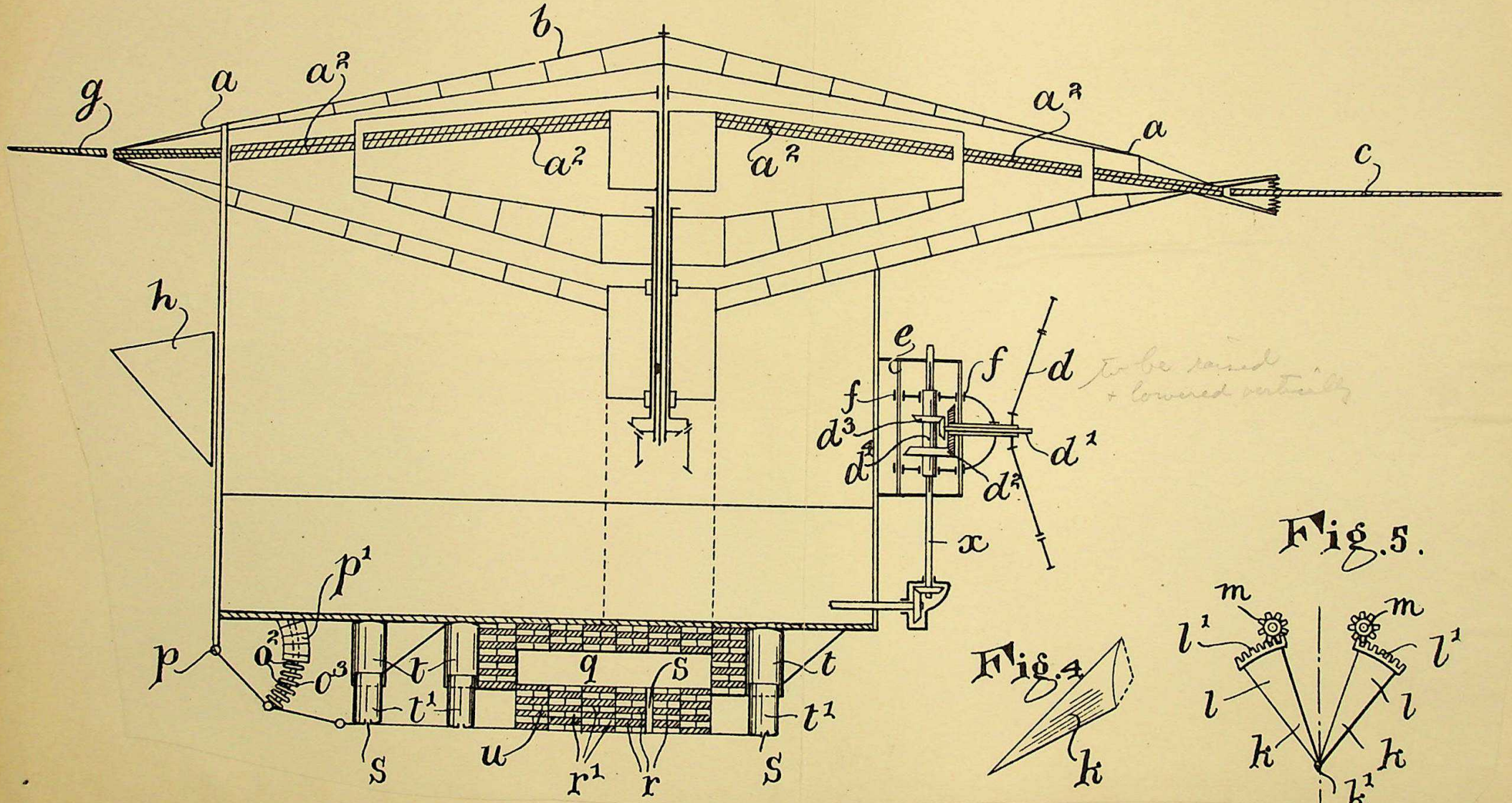
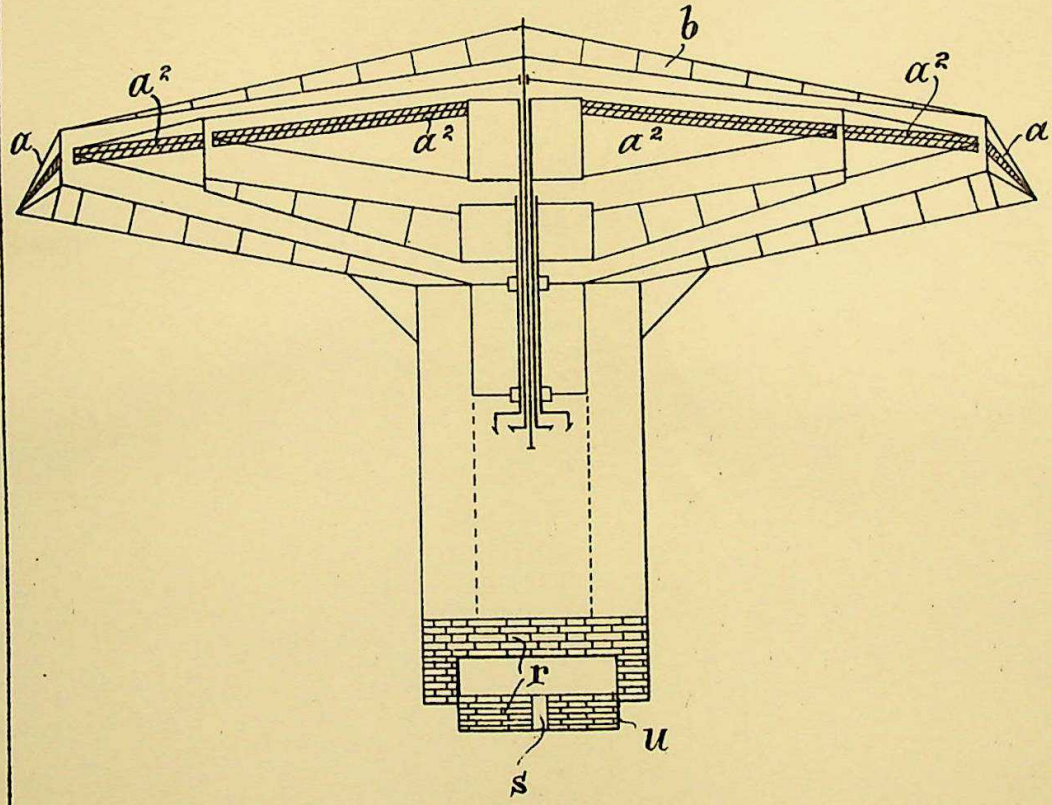


Fig. 4.

Fig. 5.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.3.



Malby & Sons, Photo-Litho.

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N° 23,471 A.D. 1913

DUPLICATE

(*Under International Convention.*)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in France), 16th Oct., 1912

Date of Application (in the United Kingdom), 16th Oct., 1913

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 7th Aug., 1914

COMPLETE SPECIFICATION.

Improvements in Aerial Vehicles.

We, ALEXIS BEURRIER, Gentleman, of Thaimes par Cozes, Charente Inférieure, France, and EDOUARD JEAN BIGOURDAN, Gentleman, of Maisse, Seine and Oise, France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has reference to an aerial vehicle which acts as a helicopter, a gyroplane, an aeroplane, a glider and so on, and which at the same time forms a parachute without being specially designed in any of these systems, and without the system which is not being employed interfering with that or those which are actively working.

According to this invention, the vehicle can rise vertically without the necessity of running along the ground or on any other surface, or it may follow an oblique ascending line; nevertheless it may also rise by horizontal displacement in the same way as aeroplanes. The said vehicle may also act as a glider for the flights in a descending line known as "volplanes", or even follow a vertical line, or the resultant of the components of the movement of descent like the parachute.

According to the present invention, preference is given to the use of acting or propelling planes with contrary movements and the vehicle, according to this invention, involves the entire particular, special and novel construction of several parts forming a homogeneous and inseparable whole.

Further, in the machine according to this invention use is made of a propeller which can be adjusted in height by being mounted on a bearing which is adapted to slide upon rods, and it is admitted that such vertical adjustment of a propeller is not novel *per se*.

In the annexed drawing, given by way of example, and representing the subject matter of the invention:

Fig. 1 is a perspective view of the vehicle.

Fig. 2 is a longitudinal section.

Fig. 3 is a transverse section.

Fig. 4 shows one of the moveable rudders seen in perspective.

[*Price* 8*d*.]

Fig. 5 represents the base of a sector of a cone with the controlling gear of the moveable rudders.

The principal part *a*, forming the carrying or sustaining surface is composed of one flat and one convex part, of a truncated oval form.

The front portion of the part *a* on the truncated base, the border of this carrying surface, assumes a straight, horizontal form, flattened as far as possible so as to present only a thin and tapering body in order to diminish the resistance of the air when in motion. This border begins to curve in oval form, from the truncated base, which is straight and horizontal and in the same plane, but somewhat further on, the edges band on both sides more and more towards the ground as shown in Figs. 1 and 3, continuing and retaining this inclined form towards the stabiliser or tail *c*.

The portion *a* is hollowed out in the centre a^1, and in this hollow the active surface or surfaces a^2, a^2, is or are mounted; it is evident that without violating the principle of the invention, any suitable active surface may be employed.

The hollow a^1 is of regular circumference in a horizontal plane; a framework *b* connects the part *a* with the body of the machine and at the same time serves as a support for the rotary parts of the active surfaces a^2, a^2.

This framework *b* carries behind the propeller *d*, connected with and mounted on the car, which may be of any suitable system. One of the principal characteristics of the invention consists in the arrangement of a framework *e* in which the horizontal shaft d^1 of the propelling wings is mounted by the aid of sliding rod bearings *f*. The object of this arrangement is to allow the shaft d^1 to move parallel to itself in the vertical plane, which enables the pilot to vary the centre of thrust of the propeller, or the point of application of its force on the machine, at any moment, even whilst flying.

The driving bevel wheels d^2 and d^3 are mounted on the sleeve d^4 so as to be capable of rotary sliding motion upon the vertical driving shaft *x* which is provided with a key guide. The said bevel wheels are slidable together with the slidable bearings.

In the front part of the surface *a*, the horizontal rudder *g* is arranged, which is controlled from the pilot's seat. The extent of its movements is regulated and limited by suitable means; at the back of the same part, a stabilising surface *c* is provided: this is formed by a plane preferably trapezoid in form, inserted at its smaller base into a support of the form < with free arms on which the stabiliser is mounted by springs in such a way that it can oscillate slightly in a vertical direction.

The stabilising surface *c* acts automatically and is not provided with any controlling gear, and acts in the manner of a rudder.

The guiding rudder *h* is formed by a surface or plane arranged vertically and pivotally mounted on the framework connecting the front part of the car with the surface *a*.

The car *i* tapers to an edge in front, and should be provided with a wind-screen i^1, not only to protect the pilot and passengers from the currents of air resulting from the speed of the machine itself and the rotation of the active propelling and sustaining surfaces, but furthermore to prevent harmful currents from passing into the car and affecting the progress of the vehicle, particularly during movements of ascent in vertical or nearly vertical planes.

The arrangement of the wind-screens i^1 is shown in the drawing merely as an indication, for their development and arrangement are subordinated to the variations resulting from the needs of construction, as for instance the shape of an inverted vessel, and so on. Moreover, such wind-screens are not new.

In the front part of the car *i* on each side of the terminating edge, two planes *k*, *k*, (see Figs. 1, 4, 5) are placed and are upwardly and rearwardly inclined at an angle of 45° approximately and form the movable rudders.

These surfaces are formed by sections of the curved surface of a cone, the apex being mounted on or close to the flooring of the car by means of a pivot k^1 whilst

the opposite part l is furnished with a rack l^1 controlled by a corresponding pinion m.

The rotation of the pinions m allows the surfaces k to be projected more or less from the car; that is to say they may present a protuberance more or less pronounced or be completely drawn into the car, in which case they do not present any projection. The movement of the surfaces k is symmetrical, that is to say, they are connected with one another and cannot move independently.

In ordinary weather, during the ascent, the volplane horizontal flying, and even during the descent, these rudders are drawn into the car and do not project externally at all; they are only intended to be used, for instance, in the event of a stoppage of the motor in the course of ascent before the vehicle has acquired any velocity.

The surfaces k k are controlled by a device within reach of the pilot, comprising suitable means of transmission so that the manipulation of the controlling gear produces a more or less accentuated projection outside of the car of the surfaces k, k, which oppose to the air on each side of the front of the car, two sectors of a cone presenting the concave surface downwards and the generators at the angle of about 45° mentioned above. At this position of the inclined surfaces the machine will incline backwards when in the air and will present the most extended surface to the resistance of the air in the line of descent, so that the machine acts as a true glider and descends in an oblique line.

The stabilising surface c rises as an effect of the upward pressure of the air, thus accentuating the forward thrust and increasing the horizontal direction.

According to this invention the aerial vehicle comprises a landing frame n, which is nearly independent of it, and which is provided with wheels o; these wheels are furnished with elastic tyres, for instance pneumatic tyres. The wheels o are mounted on metallic rods or tubes o^1 but mounted in such a manner that each wheel, in addition to the elasticity which it derives from the pneumatic tyre with which it is furnished, can also move in a vertical plane, describing the arc of a circle of which the centre is the point p; this movement is limited by an arc or rod o^2 sliding in a suitable manner, thereby compressing a spring o^3, a shoulder p^1 limiting the movement and at the same time forming a shock absorber or buffer, and for this purpose it is composed of plates interlayered with soft substances, as for instance leather, india-rubber, cork and so on.

The wheels are connected together in such a way that they form a rigid whole, so that directly one of the wheels comes in contact with the ground, or receives a shock, that shock is transmitted to the others.

The resiliency is further increased by shock absorbing means consisting of an air compressing chamber q and telescopic tubes t, t^1 connecting the landing frame n to the car of the machine. The said air compressing chamber q is arranged directly below the floor of the car and is built up of a number of blocks or the like r of resilient material, cork for example, between which air spaces r^1 are left. A structure u also built of blocks r with intervening air spaces r^1 and closely fitting the air chamber is adapted to move within same in piston-like manner.

The shock on the landing frame is in the first place taken up by the wheels, then by the shock absorbing springs and finally by the air cushions which are formed by the structure u and the tubes t^1 moving upwardly within their chambers q and t respectively. Holes s are provided in the members u and t^1 which prevent damage to the parts owing to excessive compression, and in addition, the walls of the chamber q and the piston u are rendered porous or perforated owing to the provision of the aforesaid air spaces r^1 so that excessively compressed air can escape not only through the hole s in the piston q, but also through the perforations all over the surface of the two structures.

According to the invention the vehicle presents the maximum of stability

and is invertible in the air by reason of the position of the centre of gravity of the machine which is very low and beneath the centre of support.

The greater number of the operations are carried out automatically, independently of the regulation and of the action of the motor which may be of any suitable kind and type, as well as the letting in and disengaging of the clutch and so on, of the active surfaces (supporting wires and so on).

Two hand wheels are moreover necessary to control the vertical and the horizontal rudders and by way of exception, in case of descent, abnormal descent and so on a control for the oblique rudders *k*, *k*.

The stopping of the rotary supporting surfaces results in the machine acting as a parachute.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An aerial vehicle of the type having a carrying surface in the form of a curved truncated oval and distinguished by the arrangement according to which the centre is cut out in a circle; the front portion of the oval being of straight and horizontal form, flattened to present a thin tapering body and beginning to curve in oval form from the truncated base which is straight and horizontal in the same plane, further on the edges bending at a gradually increasing inclination towards the ground, said inclination being continued and retained towards the tail of the vehicle.

2. In an aerial vehicle as claimed above, arranging the driving propeller so as to be able to move the line of the pushing force in a vertical plane in relation to the centre of gravity of the machine.

3. In an aerial vehicle as claimed in Claim 2, mounting the propeller on vertical rods upon which it is adapted to slide up and down in a plane parallel to its axis.

4. In an aerial vehicle as claimed in any or all of Claims 1 to 3, the arrangement of a horizontal rudder in front of the prolongation of the main supporting plane adapted to be regulated at will, and of a horizontal stabilising plane or tail adapted to oscillate automatically and arranged at the back of the said main supporting plane.

5. In an aerial vehicle as claimed in any or all of Claims 1 to 4, the arrangement of a vertical rudder pivotally mounted at the front of the car so as to be suitably controlled, whilst two movable rudders are arranged from the base to the upper part of the car and adapted to be entirely drawn into said car as deemed necessary by the pilot, said rudders being inclined upwardly and rearwardly at an angle of about 45° and in the shape of a section of the curved surface of a cone.

6. In an aerial vehicle as claimed in any or all of the preceding claims, the provision of a supporting frame serving also as a landing frame and which is mounted on wheels with pneumatic tyres, and having shock absorbers with interpositioned layers of resilient materials such as cork, india-rubber, leather and the like; compressed air being also employed, substantially as described.

7. The improved aerial vehicle substantially as described and of which an example is shown in the accompanying drawings.

Dated this 16th day of October, 1913.

HY. FAIRBROTHER,
Chartered Patent Agent,
33, Cannon Street, London.

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